

LIST OF THE FRESHWATER RHIZOPODA OF
N. S. WALES.

Part I.

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Excepting the short paper by Dr. R. von Lendenfeld, published in our Proceedings of last year, there does not appear to be any record as to the nature or extent of this lowly yet interesting branch of our *fauna*. The following list will, I hope, prove useful to students of Australian Biology, and to others more or less interested in the geographical distribution of the family. This list being far from complete, there is a wide field yet open for investigation.

With most of the forms herein enumerated I have been familiar for the last two years, but it is only during the last few months that I have attempted any systematic search for them; hence the localities given are few in number and mostly near Sydney. The student who desires to collect Rhizopods should provide himself with a few wide-mouthed bottles, and a stick to which may be fastened either a bottle or a hook, for the purpose of obtaining plants or mud from deep water. Mosses, dead leaves, fine-leaved aquatic plants, and mud from the bottom of stagnant water should be collected and examined. Mosses such as sphagnum, may be taken home in a box or bottle without water, except that which is retained on the leaves. When required for examination the water should be squeezed out, or if this method fails the material should be washed and the sediment examined.

When gathering aquatic plants in search of any of the *unattached* forms of microscopic life, they should never be lifted entirely out of the water, but floated or pushed into a bottle with as little

disturbance as possible. By adopting this method many more living forms will be obtained than would be the case if the plants were lifted altogether out of water.

In the examination of any material it will be most convenient to use only such slips and covers as may be used subsequently for mounting purposes; by so doing any object of interest can be mounted at once. When any object of sufficient interest is seen it should be got as near the centre of the cover glass as possible; all surplus water should then be removed from the edges, and one or two drops of a 1 per cent osmic acid solution put on the slide and drawn in under the cover by means of a little strip of blotting paper placed on the opposite side; after wiping round the edges to remove any water or acid that may remain, the cover may then be luted round with very stiff shellac cement, made by dissolving shellac in spirit. If too much acid is used the objects will become quite black and useless.

I have prepared a goodly number of slides in this manner, of which some mounted over twelve months ago show no signs of deterioration. The objects include—Collared and Flagellate Monads, Amœba, Arcella, Diffugia, Clathrulina, Infusoria, Rotifers, Desmids, Diatoms, and many other microscopic organisms. Rhizopods and Heliozoa are with a little care easily fixed and preserved with their pseudopodia fully extended.

The classification adopted is that given by Prof. Leidy in his magnificent work on the "Freshwater Rhizopods of North America." After each species the author's name with references to descriptions is given, and then follow the numbers of page, plate, and figures in Leidy's monograph, which is the most complete work on the subject in English, and will, I have no doubt be the standard book of reference for many years to come. When the numbers are interrupted, as in the case of *Diffugia corona* in which on pl. xvii. of Leidy the figures are from 1 to 14, whereas the numbers in this list are 1, 2, 5, 6, 9, it means that those forms indicated by the figures only have been seen by me.

RHIZOPODA.

Order 1. PROTOPLASTA.

Sub-Order I. LOBOSA.

AMOEBÆ, Ehrenberg.

A. proteus, Rösel, Insecten-Belustigung. Nürnberg, 1755, III. 622, Tab. CI. fig. A-T; Leidy, F. Rhiz. N. Amer. p. 30, pl. I. figs. 1-8.

Frequent on the leaves of *Lemna*, *Azolla*, and *Utricularia* Shea's Creek, and near Cook's River in a freshwater swamp.

A. verrucosa, Ehrenberg, Die Infusionsthierchen, 1838, 126, Taf. VIII. fig. XI.; Leidy, F. Rhiz. N. Amer. p. 53, pl. III. figs. 1-38.

This species is rather rare. I have seen specimens from only one locality. On *Sphagnum*, Waterloo swamps.

A. radiosa, Ehrenberg, Infus. 1838, 128, Taf. VIII. fig. XIII.; Abh. Ak. Wiss. Berlin, 1830, p. 39; Leidy, F. Rhiz. N. Amer. p. 58, pl. IV. figs. 1-18.

Abundant in nearly all the localities mentioned in this list.

A. villosa, Wallich, Ann. and Mag. Nat. Hist. 1863, XI. p. 287, pl. VIII.

Very common on dead leaves and decaying vegetable matter. The posterior villi are often hidden from view by the presence of foreign materials such as sand, Desmids, and Diatoms.

Shea's Creek, Waterloo Swamps, and near Cook's River.

PELOMYXA, Greeff.

P. palustris, Greeff, Archiv für Mikros. Anat. 1874. X. p. 51, Taf. III.-V.

I found this species in abundance on floating masses of *Oscillatoria*, near Cook's River. It attains a very large size, some specimens measuring $\frac{8}{100}$ inch in length, $\frac{3}{100}$ to $\frac{4}{100}$ broad.

DIFFLUGIA, Leclerc.

D. globulosa, Dujardin, Ann. Sc. Nat. 1837, VIII. 311, pl. ix. figs. 1, a.-b.; Leidy, F. Rhiz. N. Amer. p. 96, pl. xv. figs. 25-31, pl. xvi. figs. 1-24.

Frequent on *Sphagnum* in the Waterloo Swamp, and on *Nitella* in Parramatta Park.

D. pyriformis, Perty, Mittheil. Naturf. Gesells. Bern. 1848, 168; Leidy, F. Rhiz. N. Amer. p. 98, pl. x. figs. 1-5.

The typical form appears to be rare, and I have seen only a few specimens; other varieties are the most abundant.

Var. *D. compressa*, Carter, Ann. and Mag. Nat. Hist. 1864, XIII. 3rd series, p. 22, pl. 1, figs. 5-6; Leidy, F. Rhiz. N. Amer. pl. xii. figs. 10-16.

Frequent in Waterloo Swamps, Shea's Creek, and in Parramatta Park.

Var. *D. cornuta*, Leidy, pl. xii. fig. 17.

Shea's Creek and in an old stone quarry in Moore Park.

Var. *D. vas*, Leidy, pl. xii. figs. 2-9.

Same localities as the last named.

D. urceolata, Carter, Ann. & Mag. Nat. Hist. 1864, XIII. 3rd series, p. 27, pl. 1, fig. 7; Leidy, p. 106, pl. xiv. figs. 1, 2, 5, 7, 10.

Shea's Creek and Parramatta. Rare.

D. corona, Wallich, Ann. and Mag. Nat. Hist. 1864, XIII. 3rd series, p. 241, pl. xvi. figs. 19-20; Leidy, F. Rhiz. N. Amer. 117, pl. xvii. figs. 1, 2, 5, 6, 9.

Waterloo Swamp, Shea's Creek, and Parramatta. Not common.

D. acuminata, Ehrenberg, Infus. 1838, 131, Taf. ix. fig. III.; Leidy, F. Rhiz. N. Amer. 109, pl. xiii. figs. 1, 2, 8, 9, 11.

Plentiful near Cook's River, Waterloo Swamp, Parramatta Park, and in Duck Creek, Clyde. Forms like figs. 14 and 20, in stone quarry, Moore Park. Rare.

ARCELLA, Ehrenberg.

A. vulgaris, Ehr. Abh. Akad. Wiss. Berlin, 1830, p. 40, Taf. 1, fig. vi. ; Leidy, 170, pl. xxvii. figs. 1, 2, 3, 11, 12, 25, 26, 27 and 28.

Very abundant, almost everywhere, but a very variable species. The numbers of Leidy's figures given above indicate forms similar to those I have observed from many different localities. I have seen forms like figs. 8, 9, 10 and 11 on pl. xxviii. in Leidy's book, from Shea's Creek ; but it is not common.

A. discoides, Ehr. Monatsb. Ak. Wiss. Berlin, 1843, 139 ; Leidy, F. Rhiz. N. Amer. 173, figs. 14, 15, 16, 17, 18, 23, 28, 30, 31.

This is perhaps the most common of any ; it is found associated with *A. vulgaris* and other species in the greatest profusion.

A. dentata, Ehr. Abh. Akad. Wiss. Berlin, 1830, p. 40 ; Leidy, F. Rhiz. N. Amer. p. 177, pl. xxx. figs. 10-19.

This very beautiful species is rather rare. I have found it only in two localities, in Shea's Creek and Cook's River. In the latter place I found it on *Utricularia* ; in the former on the roots of grasses, sedges and floating plants. According to Leidy's figures and description the number of spines is from 9 to 12. The specimens observed by me had from 10 to 15, but their size and general characters are identical with those of European and American examples. The figures given in the "Micrographic Dictionary" and also in Dr. Carpenter's "Microscope and its Revelations," under the name of *A. dentata*, probably represent the var. *angulosa* of *A. vulgaris*.

CENTROPYXIS, Stein.

C. aculeata, Ehr. Abh. Akad. Wiss. Berlin, 1830, p. 40 ; Leidy, F. Rhiz. N. Amer. 181, pl. xxxi. figs. 1, 3, 4, 12, 14, 23, 24, 27.

A very common and variable species both in the character of the materials by which the test is invested, and in the number of spines.

Shea's Creek, Waterloo Swamps, Cook's River, and many other places.

COCHLIOPODIUM, Hertwig and Lesser.

C. bilimbosa, Auerbach, Zeits. Wiss. Zoologie, VII. 1856, 374, Taf. XIX. figs. 1-13; Leidy, F. Rhiz. N. Amer. 184, pl. XXXII. figs. 1-25.

Frequent on *Lemna* and *Azolla* in Shea's Creek, and on *Utricularia* near Cook's River.

Sub-Order II. FILOSA.

EUGLYPHA, Dujardin.

E. alveolata, Duj. Infusoires, 1841, 252, pl. II. figs. 9-10; Leidy, 207, pl. XXXV. figs. 2, 3, 6, 11, 12, 13, 14, 15.

This is very common and may be obtained in abundance on *Sphagnum*, in the Waterloo Swamps.

TRINEMA, Dujardin.

T. Enchelys, Ehr. Infus. 1838, 132, Taf. IX. fig. IV.; Leidy, 226, pl. XXXIX.

This is a very widely distributed species. It is very abundant near Shea's Creek and in the Waterloo Swamps, near Botany.

Order II. HELIOZOA.

ACTINOPHRYS, Ehrenberg.

A. sol, Muller, Verm. Terrest. Fluv. 1773, p. 76; Leidy, F. Rhiz. N. Amer. p. 235, pl. XL.

Common in nearly all the localities given in this list.

HETEROPHRYS, Archer.

Heterophrys sp. ? I have on several occasions seen a species closely allied to, if not identical with, one figured by Leidy on pl. XLVI. figs. 7, 8, 9, 13. It existed in a pool of water off Bunnerong Road, which is unfortunately now quite dry. In the same place I found also a colourless gregarious species resembling *Raphidiophrys elegans*, but much smaller and destitute of silicious spicules. The pseudopodia are highly sensitive and the creature retracts them somewhat suddenly if disturbed. It also readily assumes an amœboid form if subjected to pressure. I hope to re-examine both these forms on some future occasion.

RAPHIDIOPHRYS, Archer.

R. elegans, Hertwig and Lesser. Archiv für Mik. Anat. X. 1874 ; Leidy, F. Rhiz. N. Amer. 250, pl. XLII. figs. 1-6.

This species is not common. I have seen it from two localities only, near Shea's Creek and in the stone quarry in Moore Park.

VAMPYRELLA, Cienkowski.

V. lateritia, Fresenius, Abh. Senck. Naturf. Gesells. II. 1856-8, 218, Taf. x. figs. 13-19 ; Leidy, F. Rhiz. N. Amer. 253, pl. XLV. fig. 10-16.

Frequent on *Spirogyra* and other floating Algæ ; often free, but usually creeping over the surface of aquatic plants.

Localities, Shea's Creek and near Cook's River.

ACTINOSPHAERIUM, Stein.

A. Eichhornii, Ehrenberg, Bericht. Preus. Ak. Wiss. 1840, 198 ; Leidy, F. Rhiz. N. Amer. p. 259, pl. XLI.

A very common species, abundant in the Waterloo Swamp and many other places.

CLATHRULINA, Cienkowski.

C. elegans, Cienk. Archiv für. Mik. Anat. III. 1867, 310, Taf. XVIII. ; Leidy, F. Rhiz. N. Amer. 273, pl. XLIV.

This species is very common on *Nitella* and other fine-leaved plants. I have found it in plenty in nearly all the places I have visited in search of aquatic life. Australian specimens appear to be more luxuriant in their growth than European or American examples, the branched or compound state being the most prevalent, whilst the solitary form is rare.

Order III. FORAMINIFERA.

BIOMYXA, Leidy.

B. vagans, Leidy, F. Rhiz. N. Amer. 281, pls. XLVII, XLVIII. figs. 5-12, and in Proc. Ac. Nat. Sc. Phil. 1875, 124.

A few months ago this species was fairly abundant in my aquarium. I saw altogether about 20 specimens, many of which I examined with great attention. When first placed on a glass slip it often assumes a spherical shape, and remains motionless for some time. Then all at once it begins to send out pseudopodia from all sides, but ultimately they appear chiefly at the ends of the main body of protoplasm. The ramifications, extreme tenuity, and rapid movement of the pseudopodal processes are really marvellous. It is a difficult matter to trace out the actual termination of the branches, on account of their tenuity and ever changing movements. The whole organism looks like an animated spider's web. I have often noticed rounded masses at some distance from, but connected with, the main body by very slender threads. In these masses there was a continued rotation of the granular protoplasm around a large non-contractile vacuole. The time during which this semi-isolation continued, varied considerably, but in one instance it lasted for over an hour. When the return movement commenced the granular matter was conveyed away first, and afterwards the large vacuole broke up into a number of smaller ones, which moved away in quick succession, and were finally merged into the main protoplasmic body. The vacuoles are very numerous, and they move about in all directions with the granular protoplasm. A spherical granular nucleus was seen in several specimens.